



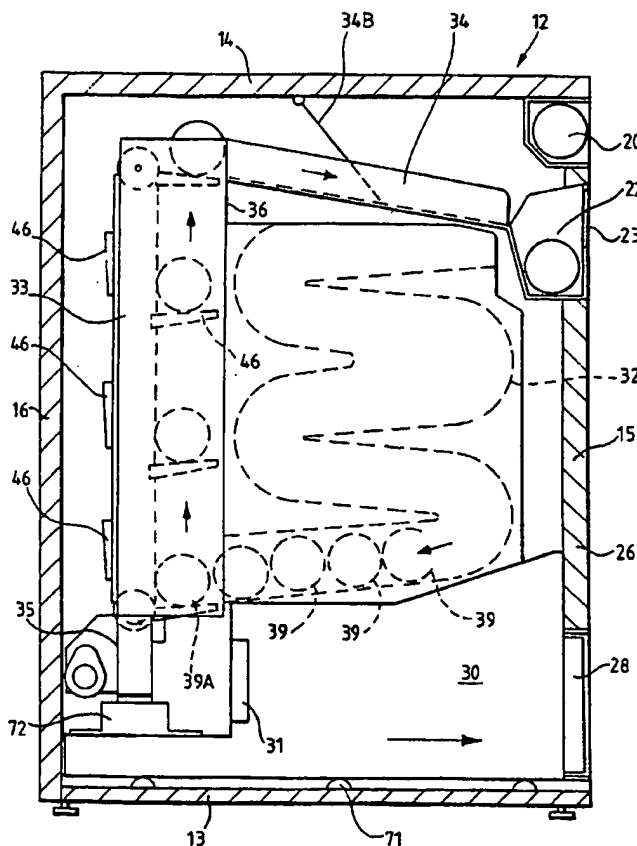
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: **VENDING MACHINE**

## (57) Abstract

A vending machine for holding and dispensing products (39), such as cans and bottles comprises a cabinet (12) defining a dispensed product access area (22) accessible from the exterior of the cabinet, one or more lifting mechanisms (33) located in the cabinet at the back, one or more product holding magazines (32) located in the cabinet at the front and arranged to supply individual products under gravitational force to the lifting mechanism(s), the or each lifting mechanism being arranged to lift products from adjacent the base of the magazine to a position above the magazine from where individual products are dispensed via a chute (34) to the dispensed product access area. The cabinet has its top (14) at table top height and the access area is in the top third of the height of the cabinet. The or each lifting mechanism comprises a continuous flexible belt (43) mounted between a pair of rollers (40, 41) located substantially one above the other and a plurality of carriers (46) pivotally mounted on the belt at spaced positions therealong. The carriers during the downward movement of the belt on which they are mounted are arranged to assume a substantially vertical position alongside the belt, and during the upward movement of the belt extend outwardly from the belt.



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## VENDING MACHINE

### BACKGROUND OF THE INVENTION

This invention relates to a vending machine and more particularly to a vending machine for dispensing products such as cans and bottles, for example cans or bottles containing drinks. The invention extends to lifting mechanisms for use in vending machines.

Conventional vending machines tend to dispense their products from adjacent the base of the machine, with the movement of the products from the storage position to the dispensing position being solely under gravitational force, and the dispensing position being adjacent the floor. This is not particularly convenient for the customer.

### SUMMARY OF THE INVENTION

One object of the present invention is to provide a vending machine which will dispense the products from a position above their storage position.

A considerable number of in-cup vending machines, particularly those for selling hot drinks, are intended to stand on a table top. Another object of the present invention, in its preferred form, is to provide a vending machine, preferably for dispensing cold cans or bottles, having a top at table height so that a conventional in-cup vending machine can be supported on its top.

Accordingly the present invention provides a vending machine for holding and dispensing products, such as cans and bottles comprising a cabinet defining a dispensed product access area accessible from the exterior of the cabinet, one or more lifting mechanisms located in the cabinet, one or more product holding magazines located in the cabinet and arranged to supply individual products under gravitational force to the lifting mechanism(s), the or each lifting mechanism being arranged to

lift products from adjacent the base of the magazine to a position above the magazine from where individual products are dispensed to the dispensed product access area.

Preferably the lifting mechanism is adjacent the back of the cabinet, the dispensed product access area is at the front of the cabinet and a dispensing chute extends between the top of the lifting mechanism and the dispensed product access area, above the magazine, along which chute products can roll under gravitational force.

Preferably the lifting mechanism comprises a continuous flexible belt mounted between a pair of rollers located substantially one above the other and the belt carries a plurality of carriers mounted on the belt at spaced positions therealong, each carrier being pivotable relative to the belt. The invention extends to a lifting mechanism per se for use in a vending machine.

With advantage the carriers are arranged to maintain a substantially horizontal orientation extending outwardly from the belt during their upward travel with the belt and a substantially vertical orientation flat against the belt during their downward travel with the belt. During the majority of the upward travel each carrier is tilted slightly from the horizontal so that its outer end is higher than its inner end adjacent the belt and a product thereon therefore tends to roll towards the belt. As the carrier approaches the top of the belt the orientation of the carrier changes so that its outer end tips slightly downwardly so that a product rolls off the carrier. As it passes over the top roller the carrier is horizontal so that it does not project substantially above its belt mounting.

Preferably the rollers on which the belt is mounted extend between two spaced upright support members and each carrier includes a cam member which in its upward path is guided in a guide channel, the cam and guide channel serving to locate the carrier at the required orientations. Preferably there is a cam and guide channel at each side of the carriers; with advantage these or other surfaces contacted by the cans in their upward paths are made of low friction material, for example polyethylene.

Preferably the vending machine is for dispensing cold cans or bottles and includes a cooler unit in the cabinet. Preferably the cooler unit is located beneath the magazine and includes a fan for circulating cold air from the cooler unit up through the lifting mechanism and down through the magazine back to the cooler unit. The cooler unit is insulated from the cold part of the cabinet, and the cold part provided with seals.

Preferably the cabinet is substantially rectangular sectioned and has a top at normal table height for example 750 to 950 millimeters, with the dispensed product access area at a height of at least two-thirds of the height of the cabinet.

There will normally be a plurality of magazines arranged side by side, preferably in the front part of the cabinet, each associated with its own lifting mechanism, preferably at the back part of the cabinet, and each for dispensing one selection of can or bottle. Conventional means will be provided for selecting and paying for the products to be dispensed.

The cabinet is normally closed to prevent access to the products in the magazines but preferably the front comprises a door which can be removed or hinged open to provide access to the magazines for refilling. With advantage the cooler unit, magazines and the lifting mechanisms can be slid forward out of the open front of the cabinet to an accessible position for maintenance. Preferably each lifting mechanism is a plug in unit which can be removed as a whole after disconnecting electrical connections and a new unit plugged in.

#### BRIEF DESCRIPTION OF THE DRAWINGS

One embodiment of vending machine, in accordance with the invention, will now be described, by way of example only, with reference to the accompanying diagrammatic drawings of which:-

Figure 1 is a side sectional view of the vending machine,

Figure 2 is a front view of the cabinet indicating in broken line a plurality of magazines and lifting mechanisms within the machine,

Figure 3 is a front view of one lifting mechanism,

Figure 4 is a section on the line IV-IV of Figure 3

showing a lifting mechanism,

Figure 5 is a front view of one guide channel and cams travelling therein,

Figure 6 is a side view of the guide rail defining the guide channel of Figure 5,

Figure 7 is a view similar to Figure 4 of the top part of a lifting mechanism slightly modified and showing a carrier in various positions, and

Figures 8 and 9 show a plan view and side view of an alternative means for forming a cam guide channel.

#### DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

The vending machine comprises a substantially rectangular sectioned closed cabinet 12 having a base 13, a top 14, a front 15, a back 16 and sides 17 and 18. The top is at substantially table-top height for example in the range 750 to 950 millimeters. In this example the cabinet has outer dimensions of height 895 millimeters, width 730 millimeters and depth 660 millimeters. The front 15 is provided with a display and selection unit 20 for displaying a range of cans 21 which can be selected to be dispensed from the machine. Below the display unit but still in the top one-third of the machine the front defines a dispensed can access area 22 accessible from the exterior of the machine through a hinged flap 23. The machine includes a conventional coin receiving mechanism 24 and selector vend buttons 25. The front 15 is in the form of a hinged door 26 with a lock 27, which can be opened by authorised personnel for restocking the machine with cans, and the door incorporates air inlet and outlet grills 28, 29.

Located in the cabinet at its base is a cooler unit 30 including refrigeration means of conventional form and a fan 31. Immediately above the cooler unit are a plurality of can storage magazines 32 arranged side by side and each associated with its own lifting mechanism 33. The top of each lifting mechanism is connected by an associated dispensing chute 34, located above its magazine 32, to the dispensed can access area 22. A lightweight flap 34B extends from the top into the chute to deter circulation

of cold air out of the machine. It is lifted automatically by a can rolling down the chute.

Each magazine 32 defines a channel of S shape arranged to hold a plurality of cans or bottles 39 on their sides so that they will roll down the magazine under gravity to a waiting position within the lifting path of the associated lifting mechanism; the can in this waiting position being indicated as 39A.

The cooler unit is arranged to circulate cold air from its back, up through the lifting mechanisms and down through the magazines. The cooler unit walls are insulated and seals are provided around the edges of the cold part of the cabinet particularly around the edges of the door and edges of the cooler unit.

Each lifting mechanism 33 includes a pair of spaced, box sectioned, upright supports 35, with forwardly extending side walls 36, and connected to each other by three spacer bars 37. The supports 35 may, for example, be extruded from aluminium or formed from sheet metal material. Upper and lower rollers 40, 41 extend between the supports 35 and are mounted in bearings 42. An endless flexible belt 43, of plastics material, extends between and around the rollers 40, 41. The bearing blocks 42A of the upper crowned roller 40 are adjustable in position by tension members 44 to tension the belt. The belt is provided with seven equally spaced ridges 45 with bores extending therethrough and carriers 46 are mounted on the belt at the positions of the ridges. Each carrier 46 comprises a pair of side arms 47, spaced apart more widely than the belt (but less widely than the length of a can) and angled slightly away from one another towards their outer ends 48 which are connected by a connecting arm 49. The arms 47 are pivotally located adjacent their inner ends by spigots 50 extending into the ends of the bore in the associated ridge of the belt and these inner ends carry outwardly extending cams 51. Each carrier can thus pivot relative to the belt about a horizontal axis coaxial with the bore of the associated belt ridge.

The lower roller 41 is connected by pulleys 52, 53 and a drive belt 54 to a motor 55. The motor is thus arranged to drive

the belt via the lower roller 41, while the upper roller 40 is an idler roller driven by the belt. The motor is connected by a disconnectable plug 56 to a power supply and electronic on and off controls. Alternatively the motor may be mounted adjacent the top of the supports to drive the upper roller, with the tensioning for the belts located to bear on the lower roller bearing blocks.

A vertical guide rail 60 is located in each of the upright supports 35 and formed with a guide channel 61. During their upward paths the cams 51 locate in the guide channels 61, as best seen in Figure 5, although this drawing does not show the carriers at their correct spacings. During their downward path, on the run of the belt nearest the back of the machine, the carriers 46 hang downwardly from their mounting adjacent the belt surface in a substantially vertical orientation. At the start of their upward path, on the run of belt facing the front of the machine, the cams 51 engage in the guide channels 61 and cause the carriers to assume a substantially horizontal disposition projecting forwardly from the belt but with the outer ends slightly higher than the inner ends. As seen in this position the carriers are tipped upwardly from the horizontal to make an angle of  $85^{\circ}$  with the upward vertical (preferably in the range  $82^{\circ}$  to  $87^{\circ}$ ). As a carrier passes through the waiting position it will contact the can 39A in that position and that can will then be lifted up to move with the carrier; the slight upward tilt of the carrier retains the can thereon and in contact with the front of the guide rails. The next can in the magazine will then roll down to the waiting position. As a carrier approaches the top of the lifting mechanism, the guide channel widens and changes the orientation of the cams and thus the carrier, so that the upper surface of the carrier makes an angle of  $97^{\circ}$  with the vertical, and such that it is tilted slightly downwards with its outer end lower than its inner end, and a can thereon rolls down the carrier on to the dispensing chute 34 and to the dispensed can area 23. The guide rails and cams are made of a low friction plastics material such as polyethylene. The cans slide against the low friction material of the guide rails during their upward paths on the lifting mechanisms.



After the carrier with a can thereon reaches the dispensing position at which the carrier tips and dispenses the can to the dispensing chute, the following can contacts a switch 62 which acts to switch off the motor. The switch may be a contact switch or a proximity detector for example. The selected motor is again operated for incremental movement by insertion of a coin and operation of a select button, in conventional manner.

The shape and dimensions of the guide rails and cams are shown in Figures 5 and 6. As shown each cam has a dimension in the direction of the vertical during its upward travel which is greater than its width dimension and has one substantially flat side 63 and a curved top 64 and other side 65 so that it is wider at the top than the bottom. The main length of the guide channel has a width substantially the same as the width of the cam at its major width dimension so that the flat side 63 of the cam contacts one wall 66 of the guide channel and the other side of the cam has minimum area of contact with the other wall 67 of the guide channel. The cam is thus held at a position in which it cannot tip as it travels up the guide channel and in this position the carrier is maintained at the required  $85^{\circ}$  orientation relative to the vertical. The guide channel is open at its top and bottom to allow the carrier to enter and leave the guide channel with the edges defining the entrance 68 and exit 69 radiused as shown. Adjacent the top of the channel it widens at 70 (from about 5mm to about 8 mm) thus allowing the cam to tip and give the required  $97^{\circ}$  (preferably in the range  $94^{\circ}$  to  $100^{\circ}$ ) orientation of the carrier. The guide channel at the opposite side will be of the opposite hand to that shown in Figure 5.

Several alternative constructions will now be described which do not affect the basic operation of the vending machine. As seen in Figure 8 and 9 the upright supports 35 are C sectioned rather than box sectioned over the majority of their lengths and are constructed from sheet metal to themselves define the guide channels 61A of similar shape to channels 61. The channel 61A seen in Figures 8 and 9 is formed between metal strips 61B and 61C and at the top between strip 61C and the top of a plastics material strip 61D, of low friction material, secured along the

front edge of strip 61B. The plastics material strips 61D will be contacted by the cans as they are being lifted by the carriers.

The carriers 46, instead of being mounted in ridges 45 on the belt, are pivotally mounted in brackets secured to the belt, for example by rivets, at spaced intervals.

As seen in Figure 7, the motor 55 may be mounted at the top of the supports 35 and this drawing shows the movement of the carriers as they travel over the top of the roller 40. Initially a carrier drops below the  $97^{\circ}$  angle under gravitational force as its cams clear the guide channels 61. The cams then contact the roller 40 so that the carrier as seen at 46A is substantially horizontal at the top of its path. In this position the carrier does not extend substantially above its mounting. This ensures that the lifting mechanism need not extend upwardly much beyond the position at which it dispenses a can to the chute. The carrier at 46B then passes between the motor and belt in a substantially vertical disposition adjacent the belt and extending upwardly from its pivotal mounting. When the carrier at 46C has cleared the motor it flips through  $180^{\circ}$  to be suspended substantially vertically adjacent the belt and below its mounting. A bar 75 between the supports 35 contacts the cams on their downward movement to ensure that the carriers do flip through this  $180^{\circ}$ . At the bottom of its path the cams of the carrier contact the roller 41 which helps to turn the carrier to the position where the cams enter the bottom of the guide channel 61.

The lifting mechanisms, magazines and cooler unit are mounted on a base on a slideway 71 and the arrangement is such that with the front door opened these mechanisms can be slid out of the then open front of the cabinet to provide access for maintenance. Each of the lifting mechanisms with its motor can be disconnected electrically and then pulled out from its support 72, lifted out and a new unit plugged in. The electrical and control units are preferably also mounted to slide out with the other units. All maintenance can thus be done from the front.

A unit for vending hot drinks may be located on the top of the cabinet. The vending mechanism may be incorporated in

the hot drinks unit with an electrical connection to the cold drinks unit described herein.

## CLAIMS

1. A vending machine for holding and dispensing products, such as cans and bottles (39) comprising a cabinet (12) defining a dispensed product access area (22) accessible from the exterior of the cabinet, one or more lifting mechanisms (33) located in the cabinet, one or more product holding magazines (32) located in the cabinet and arranged to supply individual products under gravitational force to the lifting mechanism(s), characterised in that the or each lifting mechanism is arranged to lift products from adjacent the base of the magazine to a position above the magazine from where individual products are dispensed to the dispensed product access area.
2. A machine according to Claim 1 characterised in that the or each lifting mechanism (33) is adjacent the back (16) of the cabinet, the dispensed product access area (22) is at the front (15) of the cabinet and a dispensing chute (34) extends between the top of the lifting mechanism to the dispensed product access area, above the magazine (5), along which chute products can roll under gravitational force.
3. A machine according to Claim 1 or Claim 2 characterised in that the cabinet has a top (14) at table top height and the access area is in the top third of the height of the cabinet.
4. A machine according to any of Claims 1 to 3 in which the or each lifting mechanism comprises a continuous flexible belt (43) mounted between a pair of rollers (40, 41) located substantially one above the other and characterised by a plurality of carriers (46) pivotally mounted on the belt at spaced positions therealong.
5. A machine according to Claim 4 characterised in that the carriers, during the downward movement of the belt on which they are mounted, are arranged to assume a substantially vertical position alongside the belt, initially extending upwardly from their pivotal mounting and during said downward movement pivoting through substantially 180° so as to hang downwardly from their pivotal mounting.
6. A machine according to Claim 4 or Claim 5 in which during the upward travel of a belt the carriers project outwardly from the belt, characterised in that in the lower part of their upward

path they are at an angle slightly tipped upwardly from the horizontal, and adjacent the top of their path they are at an angle slightly tipped downwardly from the horizontal.

7. A machine according to Claim 6 characterised in that said slightly upwardly tipped angle is in the range  $82^{\circ}$  to  $87^{\circ}$  to the upward vertical.

8. A machine according to Claim 6 or Claim 7 characterised in that the slightly downwardly tipped angle is in the range  $94^{\circ}$  to  $100^{\circ}$  to the upward vertical.

9. A machine according to any of Claims 6 to 8 in which the rollers 40, 41) on which the belt is mounted extend between two spaced upright support members (35) characterised in that one or each of the support members defines a guide channel (61) and each carrier includes one or two cam members (51), the or each of which is arranged to be guided during its upward path in one of the guide channels, the or each cam and guide channel serving to locate the carrier at the required orientations.

10. A machine according to Claim 9 characterised in that the cam and or guide channels are made of low friction material.

11. A machine according to Claim 9 or Claim 10 characterised in that the or each guide channel, in the majority of its upright path during which the carriers are maintained with said backward tilt have a width substantially corresponding with the maximum width of the cam therein and at their upper portions (70) the channel widens to allow the carriers to tilt to their slightly downwardly tilted position under gravity.

12. A machine according to any of Claims 4 to 11 characterised in that the carriers, during their movement, at the top of the belt travel assume a substantially horizontal position in which they do not project substantially above their mountings.

13. A machine according to any of Claims 1 to 12 characterised in that the upright surfaces (66, 67) contacted by the cams in their upward paths on a lifting mechanism are made of low friction material.

14. A machine according to any of Claims 1 to 13 including a cooler unit (30) in the cabinet.

15. A machine according to Claim 14 in which the cooler unit (30) is located beneath the magazine or magazines and includes a

fan (31) for circulating cold air from the cooler unit up through the lifting mechanism or mechanisms and down through the magazine area back to the cooler unit.

16. A machine according to Claim 14 or Claim 15 in which the cooler unit is insulated from the cold part of the cabinet containing the magazine(s) and lifting mechanism(s) and the cold part is provided around its edges with seals.

17. A machine according to any of Claims 1 to 16 including a plurality of magazines (32) arranged side by side in the front part of the cabinet, each magazine being associated with its own lifting mechanism (33) located at the back of the cabinet and including an openable front door (26) to the cabinet which can be opened to provide access to the magazines for refilling.

18. A machine according to any of Claims 14 to 17 in which the cooler unit, magazine(s) and lifting mechanism(s) are mounted on a common base so that they can be slid forward out of the open front of the cabinet to an accessible position for maintenance.

19. A machine according to any of Claims 1 to 18 in which the or each lifting mechanism (33) is a plug in unit which can be removed as a whole after disconnecting electrical connections and a new unit plugged in and connected.

20. A lifting mechanism comprising a continuous flexible belt (43) mounted between a pair of rollers (40, 41) one above the other, a plurality of carriers (46) pivotally mounted on the belt at spaced positions therealong and means (51, 61) for controlling the orientation of the carriers relative to the belt during the travel of the belt around the rollers.



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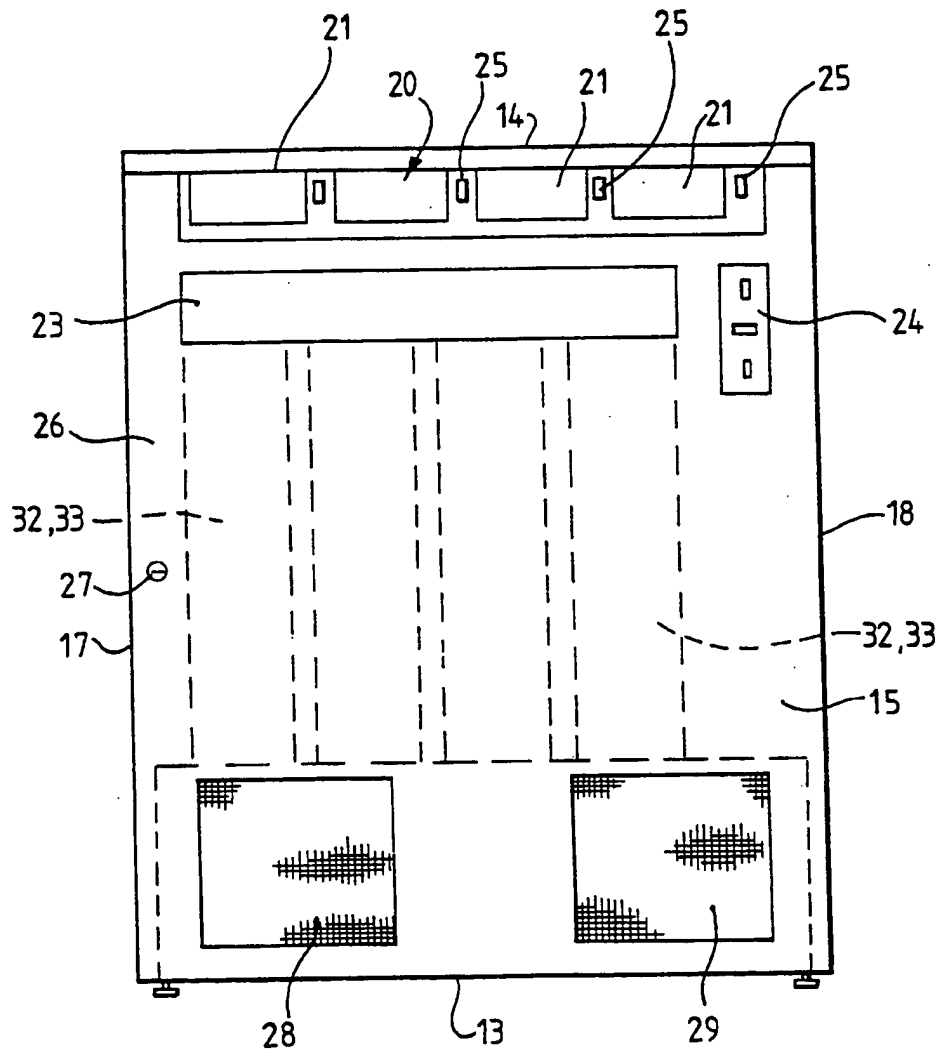
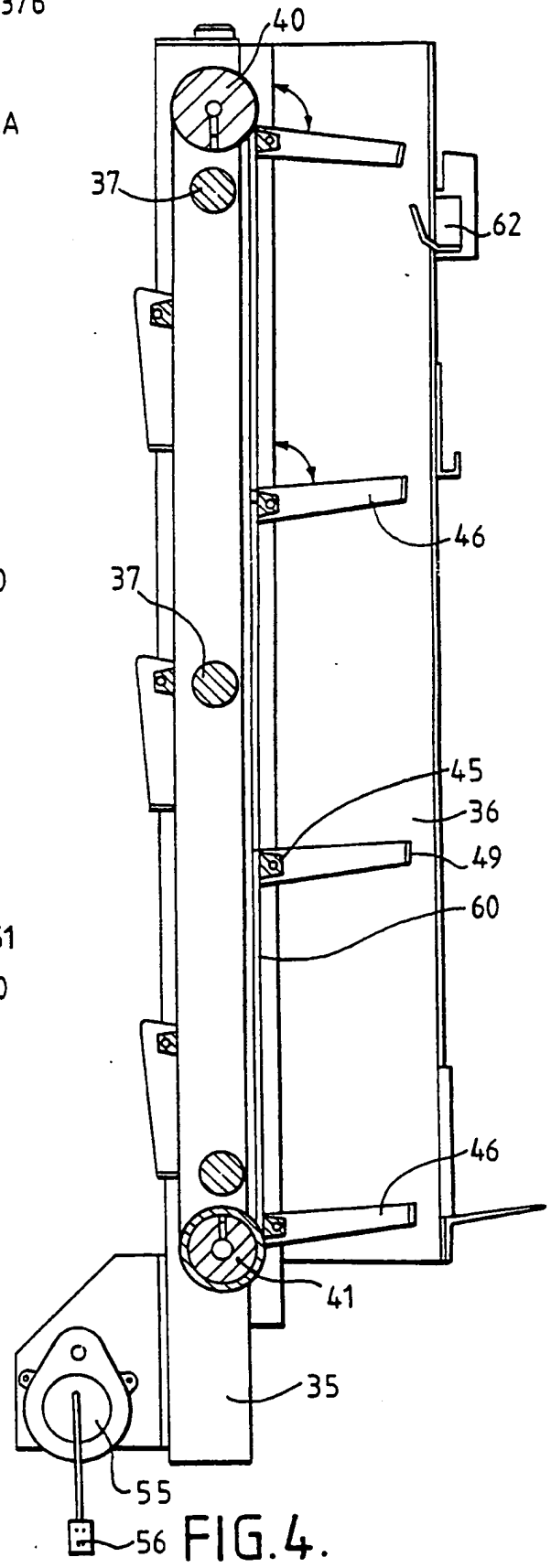
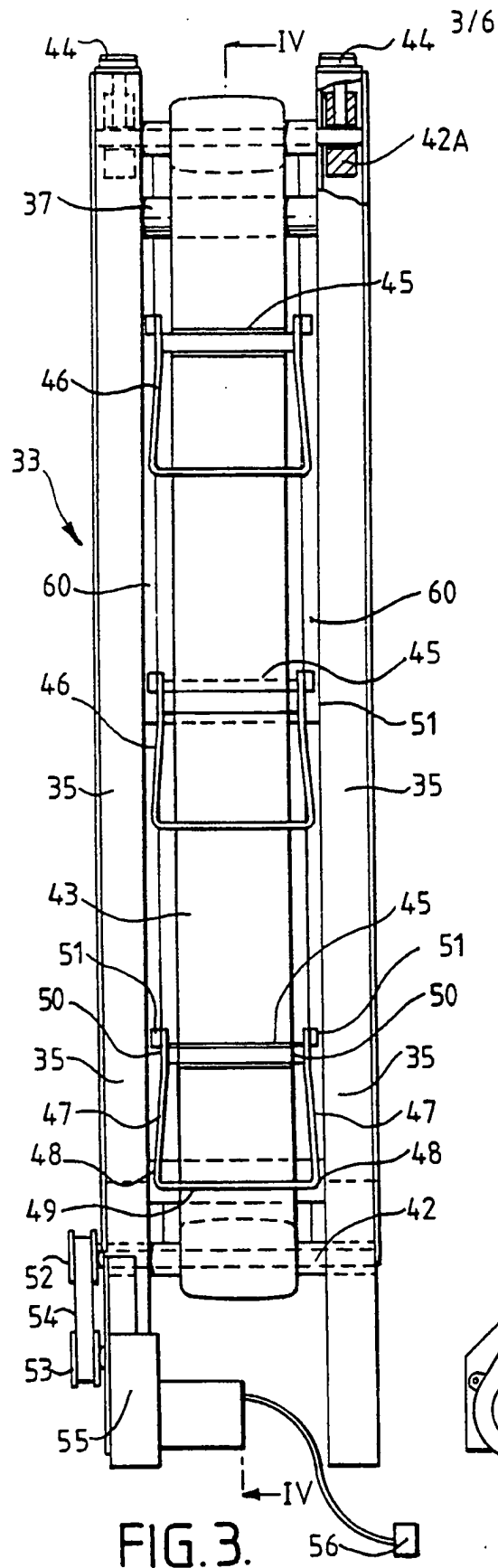


FIG. 2.





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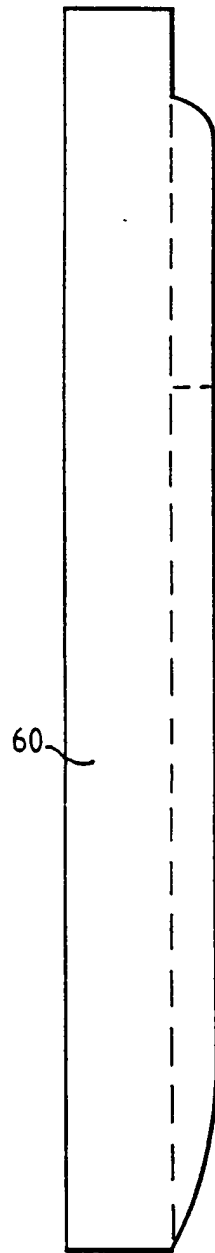


FIG. 6.

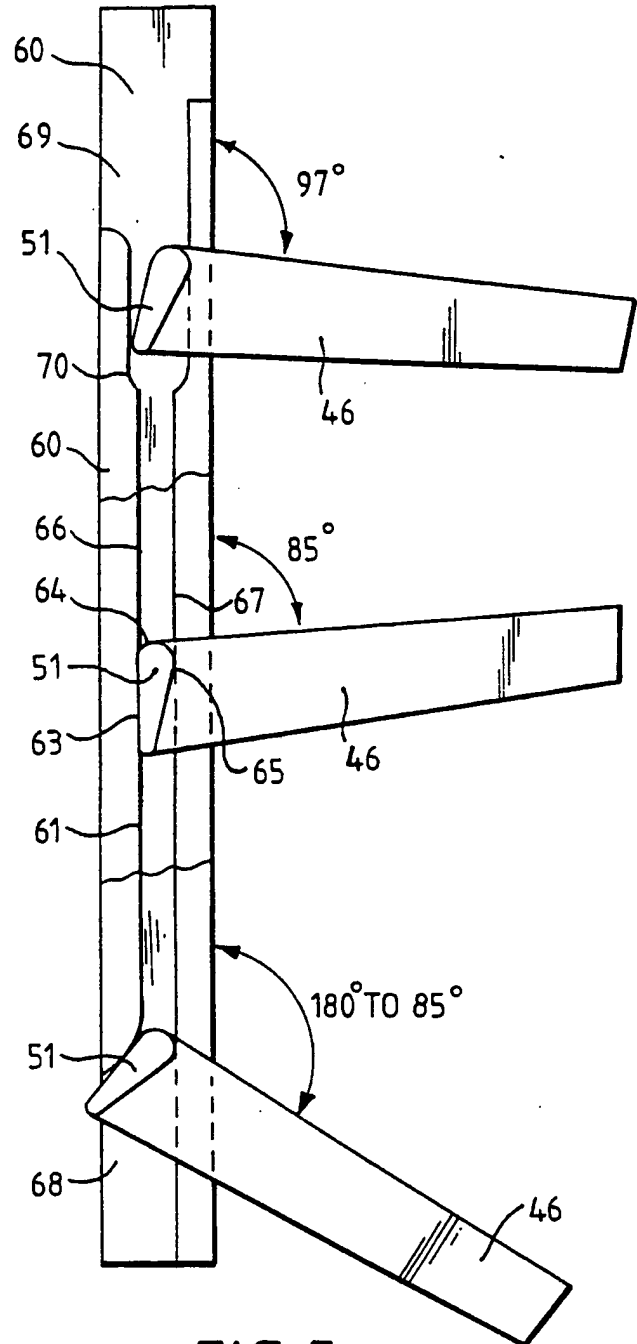


FIG. 5.

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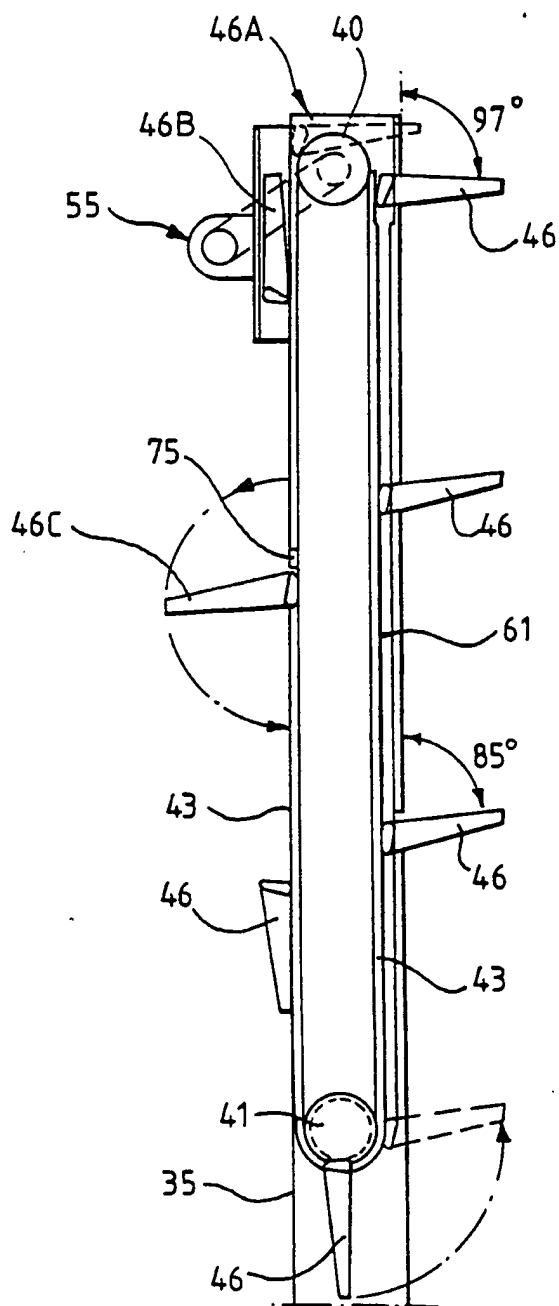


FIG. 7.

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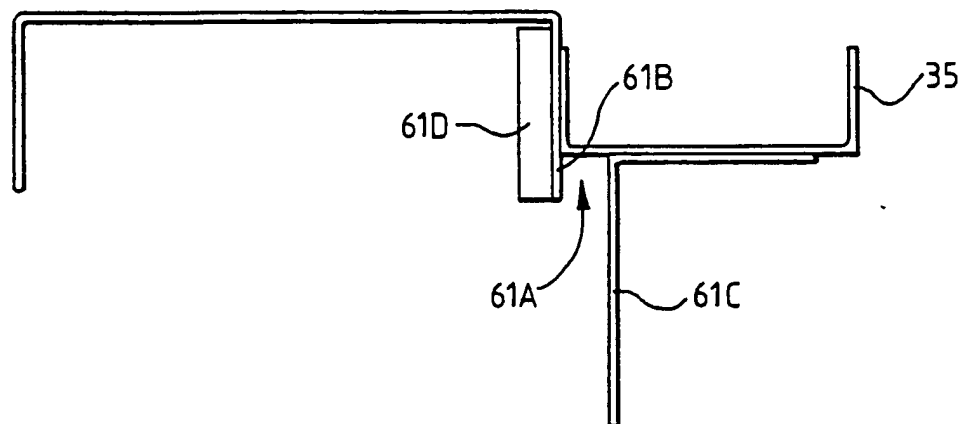


FIG. 8.

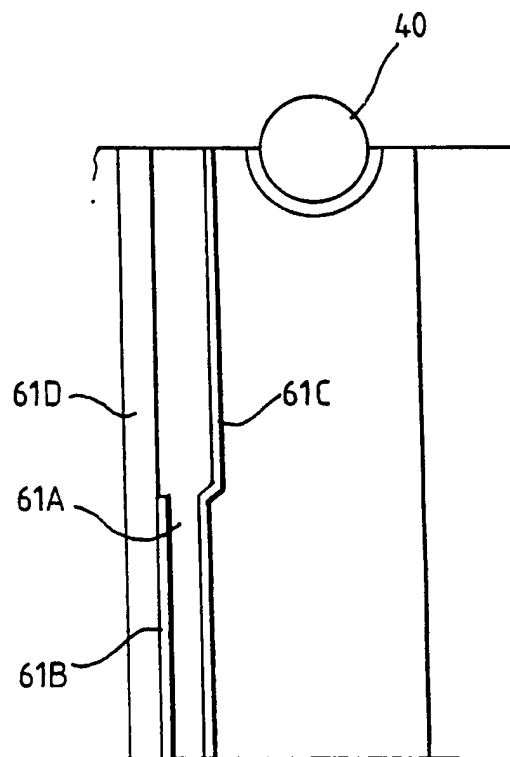


FIG. 9.

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## INTERNATIONAL SEARCH REPORT

Inter. nat. Application No

PCT/GB 94/00861

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 5 G07F11/26

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 5 G07F G07D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,1 713 466 (C.A. BUTLER) 14 May 1929 see figures ---	1,3,4, 14,16,17
X A	EP,A,0 368 699 (DATAA) 16 May 1990 see abstract; claims; figures ---	1,3-5 6,20
A	US,A,4 469 245 (L.A. FISH) 4 September 1984 see abstract; figures see column 2, line 41 - column 3, line 13 ---	1-4
A	US,A,3 722 743 (R.C. ATCHLEY) 27 March 1973 see abstract; figures ---	1,5-13, 20
A	EP,A,0 071 438 (MARS) 9 February 1983 ---	
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

8 August 1994

Date of mailing of the international search report

24.08.94

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 94/00861

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,A,40 20 546 (K. KUBON) 2 January 1992 -----	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter. Application No

PCT/GB 94/00861

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US-A-4469245	04-09-84	NONE	
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